

## SUBJECT: Tulsa District Hearing Conservation Program

1. General. The hearing conservation program is designed to protect the employee from hearing loss due to occupational noise exposure. In the last several years the incidents of occupational hearing loss have increased in Tulsa District. As our workforce matures hearing losses have increased.

2. Purpose. This memorandum establishes policies and procedures for implementing and maintaining the Tulsa District's Hearing Conservation Program.

3. Applicability. This memorandum applies to all elements of the Tulsa District.

4. References.

- a. EM 385-1-1 Engineers Safety and Occupational Health Requirements Manual
- b. ER 385-1-89 Engineers Hearing Conservation Program
- c. AR 40-5, Preventive Medicine
- d. DA PAM 40-501, Hearing Conservation
- e. Hearing Protection Requirements for Powerhouse Employees, Safety Office Memorandum dated 6 January 1999.

5. Noise Hazard Identification.

a. Noise or sound is primarily transmitted to the ear through air as a wave. The hazard from the noise depends on the frequency (pitch) the intensity (loudness), and the duration of the noise.

b. Normal conversational speech is approximately 60 decibels (A). When you have to shout to be heard in a normal conversation, you are probably in an area where the noise is at least 85 decibels. Average street traffic is also approximately 85 decibels. Extended exposure (8 hours or more), to noise levels approximately 85 decibels (A) or greater, have been shown to induce hearing loss.

c. All Department of Defense employees are required to wear hearing protection **whenever noise levels reach 85 decibels (A) regardless of duration.** Non-DOD employees and contractors shall refer to Appendix B for permissible noise exposure based on noise duration. High noise work requires hearing protection.

d. All Tulsa District employees who have been identified in

high-risk hearing related work or who have had a recorded hearing shift are **required** to wear hearing protection while working. Hearing protection is required to be worn at all times in powerhouses, whether the turbines are in operation or not. See Appendix D.

## 6. Noise Measurements.

a. Noise is measured using a sound level meter. Noise is measured in decibels. Decibels are a logarithmic scale. Therefore the difference in sound level between 80 decibels and 85 decibels is not an increase in 5. The sound is doubled every 5 decibels. Eighty-five decibels is twice as loud as 80 decibels.

b. Noise measurements are typically given in both the A and C scale. The A scale is based on human hearing. The A scale is used to determine when hearing protection is required. The C scale is closest to the true level of sound present. The difference between A and C scale is almost entirely the energy produced by low frequencies. The generation of power typically produces this type of energy.

## 7. Hearing Loss.

a. Exposure to noise can induce a hearing loss. Hearing loss usually occurs slowly over time. This means you may not recognize a loss in your hearing until it becomes pronounced. Hearing loss is commonly recognized by:

1. A temporary muffling of sound after exposure to noise
2. A sensation of fullness in the ears
3. A ringing sensation in the ears (tinnitus)
4. Inability to distinguish words in conversation

## 8. Prevention.

a. The prevention of hearing loss from exposure to noise involves a coordinated application of engineering control, personnel protective equipment, and medical control measures, supplemented by health, education, supervision, and training of personnel. Initiation of a program is required in all areas where the noise exposure currently is at or in excess of 85 decibels, regardless of the duration of exposure.

b. Examples of potential engineering controls are found in Appendix A.

c. Personal protective equipment is only recommended where engineering controls are inefficient or impractical.

1. Personal protective equipment requires the use of earplugs or earmuffs.

2. Plain cotton does not attenuate noise, and is NOT an acceptable protective device.
3. Both earplugs and earmuffs will be worn in combination when noise levels exceed 115 decibels.

d. A warning sign will be conspicuously placed at the entrance to and/or the surrounding areas where sound levels exceed 85 decibels or as required by the Safety Office.

9. Inclusion Criterion.

a. All employees who routinely work with noise hazardous equipment or in a noise-hazardous area must be included in the hearing conservation program.

10. Audiometric Tests.

a. Audiometric exams will be given in accordance with the Tulsa District Medical Surveillance Program.

b. Audiometric testing will be given to employees who are potentially or actually exposed to high levels of workplace noise. Examples (also see Appendix C) include employees performing tasks such as brush clearing or tree trimming that may expose them to high levels of noise from gasoline-powered chain saws, grinding, sanding, weed eaters, and industrial processes. NOTE: Usually a clerical/office employee who occasionally walks through a high noise area would not be scheduled for an audiometric evaluation.

c. Causal or infrequent exposures of 15 minutes in any 24-hour-period to hazardous noise of 85 to 101 decibels will not require audiometric testing or formal training, but the use of hearing protectors is still mandatory.

d. A baseline audiogram will be initiated for personnel who are routinely exposed to noise in excess of 85 decibels. Thereafter, a yearly audiogram is required.

11. Caution Signs for Noise-Hazardous Areas.

a. Signs will be posted at entrances to or on the periphery of all well defined work areas in which employees could be exposed to hazardous noise.

b. Warning signs will clearly indicate that the area is a high noise area and shall indicate that hearing protectors are required.

c. When an individual machine or piece of equipment exceeds a noise level of 85 decibels, a sign, label, or decal will be placed on or near the machine to warn of high noise exposure, and that hearing protection is required while the machine or

piece of equipment is operating, except where an entire space is designated as a noise-hazardous area.

d. Signs will be in accordance with AR 385-30, Safety Color Code Marking and Signs.

12. Training.

a. Initial Orientation. All personnel included in the hearing conservation program will receive orientation training that includes:

1. The Tulsa District hearing conservation program.
2. The effects of noise on hearing.
3. Specific machinery at the job site that can produce hazardous noise exposures.
4. The purpose of hearing protectors, their advantages, disadvantages, and instruction on use and fitting and care.
5. The purpose of audiometric testing and an explanation of the test procedures.

b. Periodic Training. Each employee in the hearing conservation program will also be given refresher training on the subject at least annually. Films are available from the Safety and Occupational Health Office to help you with your training needs.

13. If you have any questions regarding the Tulsa District Hearing Conservation Program, call us in the Safety Office.

BOB W. VANDEGRIFF  
Chief, Safety and Occupational  
Health Office

## APPENDIX A

### a. Maintain equipment by

1. Replacing or adjusting worn, loose, or unbalanced machine parts.
2. Correctly lubricating machine parts.
3. Shaping and sharpening cutting tools.

### B. Substitute machines by replacing

1. Smaller, faster machines with larger, slower ones.
2. Single operation dies with step dies.
3. Hammers with presses.
4. Square sheers with rotating sheers.

### C. Substitute processes by replacing

1. Impact riveting with compression riveting.
2. Riveting with welding.
3. Cold working with hot working

### D. Control vibration and impact by

1. Using suitable vibration isolation.
2. Avoiding resonant frequencies.
3. Varying mass.
4. Varying stiffness.
5. Increasing damping.
6. Reducing the driving force on vibrating surfaces.
7. Reducing the area of the vibrating surface.

### E. Reduce sound transmission through solids by using

1. Flexible mountings.
2. Flexible sections in pipe runs or ducts.
3. Flexible shaft couplings
4. Resilient flooring

### F. Reduce sound produced by air or gas flow by

1. Using intake and exhaust mufflers.
2. Designing fan blades to reduce turbulence.
3. Substituting smaller high-speed fans with larger low-speed fans.

### G. Isolate noise sources by

1. Enclosing individual machines.
2. Using baffles.
3. Confining high-noise machines to sound-treated rooms.

### H. Isolate the operator by providing a sound-treated booth.

## APPENDIX B

### PERMISSIBLE NON-DOD NOISE EXPOSURES

| Duration per day, hours | Sound-pressure level dB(A)<br>slow response |
|-------------------------|---|
| 8.....                  | 90  |
| 6.....                  | 92  |
| 4.....                  | 95  |
| 3.....                  | 97  |
| 2.....                  | 100   |
| 1-1/2.....              | 102   |
| 1.....                  | 105   |
| 1/2.....                | 110   |
| 1/4.....                | 115   |

## Appendix C

This is a listing of equipment in the Tulsa District which has been surveyed for hazardous noise levels. All readings were obtained using a Quest model 2500 sound level meter, serial number qm5090001, field calibrated on the date of survey using a Quest model QC-10/QC/20 calibrator, serial number QE5080119. Each source documented below were operating at normal operating conditions of the device, at operators ear level. In case of metal cutters, mild steel was used to afford realism. On wood cutting tools, 3/8" plywood was used to afford realism.

| Noise Sources  | dba | dbc |
|--|-----|-----|
| Stihl T5510AU tie saw  | 115 | 115 |
| Stihl 020AU chainsaw   | 110 | 110 |
| Stihl 038AU chainsaw   | 108 | 108 |
| Yard-Man powered leaf blower                                   | 108 | 110 |
| B&D ½" socket driver   | 106 | 99  |
| Lincoln arc welder   | 105 | 106 |
| HydraScrew HS25 air compressor                                 | 105 | 105 |
| CP pneumatic sander  | 104 | 106 |
| Miller welder (5HP)  | 104 | 99  |
| 6 cylinder Diesel emergency back-up power generators (average) | 104 | 109 |
| 9" electric B&D wildcat hand held grinder                      | 104 | 101 |
| Makita 10" mitre cutter saw (on steel pipe)                    | 103 | 98  |
| Makita LS1030 10" mitre saw                                    | 102 | 104 |
| B&D 7" grinder (electric)                                      | 102 | 98  |
| B&D cut-off wheel  | 102 | 103 |
| Stihl FS81 Weedeater   | 101 | 101 |
| B&D router   | 101 | 97  |
| John Deere 520 Tractor   | 101 | 90  |
| HydraScrew H525 air compressor                                 | 101 | 103 |
| 14" metal cut-off saw (on angle iron)                          | 101 | 100 |
| 4" pneumatic grinder   | 101 | 100 |
| CP pneumatic chisel  | 100 | 100 |
| B&D reciprocating saw  | 100 | 100 |
| Lincoln portable welder (5 HP)                                 | 100 | 107 |
| Yellow Jacket right angle grinder                              | 100 | 101 |
| Bench Grinder  | 100 | 100 |
| Delta 18" table saw  | 100 | 101 |
| ½" large pneumatic impact wrench                               | 99  | 99  |
| Miller Air-Pak welder (marine terminal)                        | 99  | 103 |
| 8" pneumatic grinder   | 99  | 99  |
| B&D 20 gallon shop vac   | 98  | 97  |
| B&D router (on plywood)  | 98  | 98  |
| Howler phone   | 98  | 96  |
| Tainter gate air compressor                                    | 98  | 108 |
| Case w/4C articulating loader                                  | 98  | 93  |

|  |    |     |
|--|----|-----|
| Stihl HT75 chainsaw                                | 97 | 97  |
| B&D 10" cut-off saw                                | 97 | 106 |
| B&D 8" circular saw                                | 97 | 106 |
| Porter Cable belt sander                           | 96 | 95  |
| Needle Gun paint/rust remover                      | 96 | 96  |
| 3/8" pneumatic socket wrench                       | 95 | 95  |
| ½" RI pneumatic socket wrench                      | 95 | 96  |
| Souix ½" pneumatic socket wrench                   | 95 | 95  |
| John Deere 310D backhoe (user RPM)                 | 95 | 100 |
| B&D 6" circular saw                                | 95 | 97  |
| Daytona 10" portable saw                           | 95 | 93  |
| 300 lb governed air compressor                     | 95 | 95  |
| Craftsman 15" table saw                            | 95 | 95  |
| WB-11 articulated front end loader                 | 95 | 105 |
| Manitowoc Crane                                    | 95 | 100 |
| Miller bobcat 225D welder                          | 95 | 98  |
| B&D bench grinder                                  | 95 | 95  |
| Chicago grinder                                    | 95 | 97  |
| Skil ½" electric drill                             | 94 | 89  |
| B&D 7"/9" HD angle grinder, electric               | 94 | 94  |
| Craftsman 10" radial arm saw                       | 94 | 97  |
| B&D 4.5" angle grinder                             | 94 | 94  |
| B&D 4" angle grinder                               | 94 | 94  |
| Ingersol Rand 7" pneumatic grinder                 | 94 | 94  |
| 2" pneumatic die grinder with cutting wheel        | 94 | 94  |
| B&D 7"/9" heavy duty angle sander                  | 94 | 93  |
| B&D 7" heavy duty grinder                          | 94 | 104 |
| Makita 14" cut-off saw                             | 94 | 102 |
| 6" bench grinder (on mild steel)                   | 93 | 92  |
| Porter Cable model 7554 BC35455                    | 93 | 93  |
| Plasma Cutter 02258                                | 93 | 93  |
| B&D ¼" electric drill                              | 92 | 90  |
| Delta 14" cut-off saw                              | 92 | 93  |
| Dam headgate hoist                                 | 92 | 95  |
| John Deere backhoe                                 | 92 | 105 |
| Hyster 250 forklift                                | 92 | 94  |
| 7" Skil circular saw                               | 92 | 93  |
| Stihl BG60AU leaf blower                           | 91 | 83  |
| CE450G Dozer                                       | 91 | 106 |
| DeWalt 4" angle grinder, electric                  | 90 | 90  |
| 22" 4HP mower (push mower)                         | 90 | 90  |
| Kohler Power Pro generator                         | 90 | 90  |
| Sump pump alarm                                    | 90 | 90  |
| John Dere 310D backhoe (idling)                    | 89 | 92  |
| P&C ¼ sheet orbital sander (small electric sander) | 89 | 91  |
| Multi-Quip portable generator                      | 89 | 96  |
| John Deere garden tractor                          | 89 | 101 |
| Cyclone Blast Capper                               | 89 | 94  |
| Delta Rockwell 10" table saw                       | 88 | 85  |



|  |    |     |
|--|----|-----|
| Daytona disc and belt sander                         | 88 | 89  |
| Multi-Quip Wisconsin 3" portable water pump          | 88 | 94  |
| Suzuki 4X4 Quad                                      | 88 | 97  |
| TD-9/04 Hyster forklift                              | 88 | 95  |
| Craftsman 5 HP shop vacuum                           | 87 | 87  |
| B&D ½" electric drill                                | 85 | 90  |
| Bench Grinder (grinding 1" steel pipe)               | 85 | 85  |
| Dayton Bandsaw metal hacksaw (on mild steel)         | 85 | 86  |
| ½" electric drill (with hole cutter blade installed) | 85 | 81  |
| Skil Sander (small electric on plywood)              | 84 | 86  |
| 6" pneumatic grinder with wire wheel brush           | 84 | 84  |
| Case W/4C front end loader                           | 84 | 106 |
| Hammond bench grinder                                | 83 | 84  |
| B&D electric hacksaw                                 | 83 | 85  |
| Water pump on Mule                                   | 82 | 86  |
| Governor pump  | 81 | 89  |
| Hilti 4" electric grinder                            | 81 | 83  |
| Electric power washer                                | 80 | 75  |
| Dirt Devil electric vacuum cleaner                   | 79 | 82  |
| Chainsaw blade sharpener (electric)                  | 77 | 76  |
| Unwatering sump pump                                 | 77 | 85  |
| Dump Truck CE40867                                   | 77 | 87  |
| Dump Truck CE46692                                   | 76 | 96  |
| 518 governed rotary hydraulic pump                   | 75 | 83  |

NOTE: These are general values based on the average noise level of the equipment tested.

## Appendix D

CESWT-SO

6 January 1999

### MEMORANDUM FOR ALL POWERHOUSE EMPLOYEES

SUBJECT: Hearing Protection Requirements for Powerhouse Employees

1. In 1998, 28 powerhouse employees experienced a hearing loss. The purpose of this memorandum is to establish specific and immediate policy actions for powerhouse employees, authorized visitors, the visiting public, and contractors. Those specific actions are as follows:

a. All Corps of Engineers employees, authorized visitors, and contractors are required to wear approved hearing protection at all times inside the powerhouses. Hearing protection is not required in office areas and the control room.

b. The visiting public, such as a school group touring the powerhouse will be offered disposable hearing protection, but not required to wear it. The Corps tour guide will be required to wear hearing protection during the tour. The ear plugs or muffs may be removed for short periods of time to answer any questions the students may have.

c. All doors leading into the main bays and out of the control rooms and offices (as appropriate) will be placarded with a "Hearing Protection Required Beyond This Point" sign. These signs can be ordered through the Safety Office by e-mail.

d. At major entry points to the powerhouses, disposable earplug dispensers must be available and maintained to provide hearing protection to the above entrants.

3. Hearing protection will be worn at all times in the powerhouses, whether the turbines are in operation or not. This information will be incorporated into the District Hearing Conservation program.

4. Please call me at 918-669-4968 if you have questions, or need additional information.

Bob W. Vandegriff  
Chief, Safety and Occupational  
Health Office

Copy Furnished:  
Chief, Operations Division